

AC NO: 21-1B

DATE: May 10, 1976



# ADVISORY CIRCULAR

## DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

**SUBJECT: PRODUCTION CERTIFICATES**

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1. **PURPOSE.** This advisory circular provides information concerning Subpart G of Federal Aviation Regulations (FAR) Part 21 and sets forth acceptable means, not the sole means, of compliance with its requirements.
  2. **CANCELLATION.** AC 21-1A dated July 9, 1971, is cancelled.
  3. **REFERENCE.** FAR, Parts 21, 37, 39, 43, 45 and 183.
  4. **DEFINITIONS AND ABBREVIATIONS.** As used herein, the following definitions and abbreviations apply:
    - a. **Article.** A material, part, component, assembly, or appliance which is used in the type certificated product, as specified in the type design data.
    - b. **Supplier.** Any person who furnishes services to a holder of a production certificate which affects a type certificated product, or who supplies articles for installation on a type certificated product, including articles which were not designed or manufactured by the type certificate holder. The term "Supplier" as used in this circular is synonymous with the term "Subsidiary" as referenced in FAR 21.143.
    - c. **Regional Office.** The Engineering and Manufacturing Branch of the Federal Aviation Administration region having jurisdiction over the geographical area in which the manufacturer is located. (In the Western Region, the Aircraft Engineering Division.)
    - d. **District Office.** The FAA Engineering and Manufacturing District Office (EMDO) responsible for evaluation and inspection of the manufacturer's facilities. (In the Western Region, the Aircraft Engineering District Office (AEDO).)
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- e. PC. Production Certificate (Ref. FAR 21, Subpart G).
  - f. APIS. Approved Production Inspection System (Ref. FAR 21, Subpart F).
  - g. PMA. Parts Manufacturer Approval (Ref. 21, Subpart K).
  - h. TSOA. Technical Standard Order Authorization (Ref. FAR 37).
5. DISCUSSION. This circular covers only those sections of FAR 21, Subpart G, where further discussion, information, and examples would be helpful. The heading of each of the following main paragraphs refers to the applicable section of Subpart G.
6. FAR 21.133- ELIGIBILITY. An application for a production certificate is made on FAA Form 8110-12, (OMB-04-R0078) Application for Type Certificate, Production Certificate, or Supplemental Type Certificate, which is submitted to the regional office.
7. FAR 21.135- REQUIREMENTS FOR ISSUANCE. Upon receipt of a properly executed FAA Form 8110-12, and following a district office preliminary survey and evaluation of the applicant's quality control data and system, the FAA will convene a production certification board at the applicant's facilities to make the final determination for issuance of a production certificate. The applicant will be formally advised as to the extent of his assistance needed in the production certification board activities, and of the findings and recommendations of the district office and the production board. Where the facilities, equipment, data, procedures, and personnel of the applicant are found to meet the requirements of FAR 21, Subpart G, a production certificate will be issued.
8. FAR 21.139-QUALITY CONTROL. A total quality control system meeting the requirements of FAR 21.139 would provide control over all phases of manufacture, including control over the manufacture of all supplier-furnished articles. The control exercised by the manufacturer over articles furnished to the manufacturer by a supplier that holds his own FAA approval (PC, APIS, PMA, TSOA) for the article may be limited to the approval of the supplier's material review systems, design changes, and to the manufacturer's usual incoming quality control procedures employed after articles are received from an outside source.
9. FAR 21.143-QUALITY CONTROL DATA REQUIREMENTS.
- a. The data required to be submitted for approval under this regulation should be submitted to the district office at the same time the application for a production certificate is submitted to the regional office.
  - b. In general, the requirements of FAR 21.143 are self-explanatory and the following paragraphs provide an example of acceptable compliance:

- (1) The manufacturer's organizational structure would ensure that any decisions with regard to workmanship, quality, conformity, safety, materials review, and corrective action are not unduly influenced by other considerations. This can be achieved by having the quality control organization report directly to top management.
  - (2) An effective quality control system utilizes well qualified inspectors in sufficient number to ensure that all articles, processes, procedures, and the completed products are inspected for conformity to data, specifications, and procedures specified in the approved type design.
  - (3) The quality control data would be arranged in manual form, with a suitable index, and should cover each portion of FAR 21.143.
  - (4) When references to other company documents or data are utilized, the manual would briefly summarize the procedure, method, or system which is referenced. Any such referenced material becomes part of the data approved by the FAA.
  - (5) In providing the description required by FAR 21.143(a)(3), the inclusion of, or reference to, supplementary data such as the following is considered helpful in showing acceptable compliance:
    - (a) Copies of all inspection and acceptance forms and checklists for articles and completed products, together with a brief outline of instructions for their use.
    - (b) Imprints of the various inspection and process stamps, and their meaning.
    - (c) A schedule of inspection and calibration intervals for production jigs and fixtures, precision inspection tools, testing equipment, including gauges and recording equipment used in controlling processes.
    - (d) A listing of manufacturing processes which are relied upon to assure quality, conformity, and safety of the completed product.
- c. An acceptable means of compliance with FAR 21.143(b) would be to provide in the quality control data a description of the system used to evaluate, monitor, and control all suppliers to whom the holder of a production certificate has delegated inspection duties for controlling conformity and quality, except that such a

description is not required for suppliers who hold an FAA approval for the article being supplied. Such a description would include an up-to-date listing, either in the manual or in a referenced company document, of all such suppliers by name, address, general nomenclature of articles or services, and any other pertinent information, such as:

- (1) Reference to the manufacturer's quality control manual by title and date.
- (2) Delegation of Material Review Board (MRB) authority.
- (3) Name and title of the manufacturer's or supplier's quality representative(s) who will make available purchase orders, drawings, and other applicable data.

d. Quality Control System Functions. A totally integrated quality control system would include the following major functions:

(1) Technical Data Control.

- (a) The usual practice is to maintain a technical data control system which ensures that only applicable FAA - approved drawings, drawing change notices, engineering data, and quality control data are available to production and inspection personnel, and that unauthorized, inappropriate, and obsolete drawings and data are promptly removed from production areas.
- (b) A drawing change control system which ensures that prior to final acceptance of products or articles, all changes to the type design are either incorporated in the applicable drawings, or described in change notices attached to such drawings.

(2) Manufacturing Processes. An inspection planning system that would provide the means for selecting and controlling procedures governing methods for:

- (a) Selection of appropriate inspection methods and plans for articles to ensure that all characteristics affecting safety will be inspected as required, to ensure conformity to approved design data and to eliminate discrepancies from completed products and spare articles.

- (b) Ensuring that any defects which might be in a lot accepted under a statistical quality control plan will not result in an unsafe condition in an end product or spare article.
  - (c) The establishing of appropriate inspection stations and the programming of inspections at each stage of production to ensure that parts, assemblies, processes, and assembly operations are inspected, and applicable tests are conducted, in accordance with data, technical materials, and procedures maintained at the station for that particular stage of production.
  - (d) Production planning is commonly achieved through use of fabrication and inspection instructions, shop travelers, checklists, or similar media, which not only provide control over fabrication and assembly operations, but also ensure that necessary inspections and tests will be conducted in the proper sequence, when articles and processes are in an inspectable condition. Such a system would provide for inspection and tests appropriate to all phases of the production cycle, from raw materials and related processes and services to the completed product.
  - (e) Production areas would be arranged to provide segregation of manufacturing processes or operations which may adversely affect other operations; for example, separation of precision inspection from each area where grinding, cutting, sanding, or painting operations are performed.
- (3) Special Processes. The integrity of processes and services utilized in the construction of articles and products is dependent upon the skill with which the work is performed, the capabilities of the equipment used, and the close control of temperatures, solutions, curing time, or other critical factors. A system to control all processes and services, such as welding, brazing, heat treatment, plating, etc., ensures that each process is performed by trained and qualified personnel and in accordance with approved specifications containing definitive standards of quality, and that periodic inspection of gauges, solutions, or any critical equipment is controlled and documented.
- (4) Inspection/Identification. Identifying articles or controlling documentation with appropriate stamps or marks traceable to the individual inspector, is a means of ensuring that only those articles and processes which have been accepted and found to conform to FAA - approved design data are used in the product.

For example: Articles rejected as being unusable would be conspicuously identified and subsequently controlled to preclude absolutely either their installation on the product, or their use as spare articles.

(5) Nondestructive Inspection.

- (a) Operators should be qualified by the manufacturer in accordance with the manufacturer's specification.
- (b) Operators' qualifications should be kept current.
- (c) Inspection procedures in specifications should be approved as part of quality control data.
- (d) Equipment should be inspected and calibrated periodically to assure accuracy.
- (e) Realistic acceptance criteria should be established.
- (f) Inspection acceptance criteria should be kept current with design data.
- (g) Records should be maintained to accurately reflect that the specification requirements are constantly met.

(6) Tool and Gauge Control.

- (a) Adequate manufacturing facilities, equipment, and tooling would have the capability and reliability to ensure production of uniform duplicate articles and products conforming to the approved type design data.
- (b) To preclude acceptance of nonconforming articles, or rejections due to improperly controlled tools and gauges, a quality control system should incorporate a schedule for inspection and calibration, to certified national measurement standards, of all inspection tools, gauges, and testing equipment, as well as production jigs, fixtures, templates, etc., which are depended upon as media for inspection. An acceptable schedule would have the inspection intervals established on the basis that such tools and gauges would be inspected prior to their becoming inaccurate, or requiring adjustment, replacement, or repair.

- (c) A recordkeeping system would ensure that each piece of equipment or container is checked prior to first usage and at the proper periodic interval, and marked to indicate the date that the next inspection is due, and is removed from inspection and shop areas or conspicuously identified to prohibit usage after expiration of the inspection due date.
- (7) Supplier Control. The holder of a production certificate is primarily responsible under the requirements of FAR 21.165 for each article used in his product; therefore, he should establish a system to ensure conformity to the type design of all articles or services obtained from suppliers. Such a system would ensure that:
- (a) Inspections and tests are extended to include supplier's inspection and tests of articles or services which cannot or will not be completely inspected upon receipt by the holder of a production certificate at his approved facilities.
  - (b) Provisions are made for the evaluation and/or surveillance of suppliers by the holder of a production certificate when he relies to any degree upon a supplier's quality control system, or has delegated inspection duties to the supplier. Minimal source surveillance by the production certificate holder is customarily an acceptable means of control when the supplier provides a certification of conformance that includes reports of quality measurement data which show objective evidence that quality standards have been met.
  - (c) Effective control is exercised to ensure conformity to approved design data of all articles obtained from suppliers who hold an FAA approval (PC, APIS, PMA, TSOA) for the article involved.
  - (d) Suppliers to the holder of a production certificate would be formally advised that their facilities' system, data, equipment, personnel, and articles being supplied are subject to evaluation and inspection by the production certificate holder and the FAA since, in effect, such supplier's facilities constitute extensions of the facilities of the holder of a production certificate.

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(e) Articles obtained from foreign suppliers are under the same degree of control that is exercised over domestic suppliers. In general, an undue burden may exist whenever the type certificate holder performs, or he has suppliers perform, any of his regulated functions outside the United States. Under such circumstances, the evaluation and approval of design changes and the evaluation, approval and subsequent surveillance of manufacturers, including the supervision of designees performing outside the United States may create a burden on the FAA in administering the FARs. In accordance with FARs 21.43 and 21.137, the determination of whether or not an undue burden exists must be made by the FAA in each case. FAA surveillance of materials, parts, and appliances is not considered to be an undue burden when:

- 1 The manufacturer completely inspects such articles for conformity and condition upon receipt in the United States, and such inspections are programmed in his FAA-approved quality control data; or
- 2 An agreement is negotiated between FAA, the foreign civil air authorities and the U.S./foreign manufacturers whereby the foreign civil air authority agrees to perform inspections and surveillance on behalf of the FAA, and certifies to the FAA that each article conforms to the FAA-approved design and is in a condition for safe operation; or
- 3 The foreign civil air authority at the country of manufacture certifies that the article meets U.S. requirements in accordance with FAR 21.502.

(f) An effective purchasing and receiving inspection system precludes release to production of nonconforming or unsafe articles procured from outside sources. Such a system would ensure that:

- 1 Purchase orders provide specifications or other design data in the detail necessary to ensure procurement of articles or services which meet the requirements of the approved type design.
- 2 All incoming articles conform to approved type design data prior to their acceptance and release to production.
- 3 Articles which are not designed or manufactured by the production certificate holder are of the same design configuration as specified in the approved type design data.





- (c) Provide for corrective action with regard to discrepancies in manufacturing procedures, processes, designs, or any other condition which caused the nonconforming articles, to ensure that all affected and subsequent products will be in conformity with the type design.
  - (d) Maintain charts or records to show the effectiveness of the corrective action program and to reveal problem areas as they arise.
- (10) Storage and Issuance. A storage and issuance system would ensure:
- (a) That only those articles which are identified as having passed company inspection are received into stores.
  - (b) Identification, segregation, and protection of articles in storage.
  - (c) Periodic reinspection and disposition of materials subject to deterioration from prolonged storage.
  - (d) Protection from damage of articles being delivered to fabrication or shipping areas or while stored in these areas prior to use.
  - (e) Incorporation of applicable design changes prior to release of stored articles for installation in the product.
- (11) Airworthiness Certification.
- (a) The usual practice is to record all inspections and tests required to be conducted during manufacture of the articles/ final product, and to retain those significant records attesting to the conformity and safety of the completed article/product for a period of at least two years.
  - (b) The effectiveness of the control exercised throughout the manufacturing cycle to ensure that quality objectives have been met is ultimately determined by the final assembly and test inspections. An acceptable quality control system would, therefore, incorporate final assembly and test procedures to ensure that:
    - 1 Each completed product is subjected to a final inspection for completeness, adjustments, safety calibration, markings, placards, etc., in accordance with the applicable configuration of the approved design data for the product and model involved. Also, that each

product is inspected for freedom from damage, contamination, and for safe operating condition.

2 The means provided for leveling an aircraft are accurately installed, and that the empty weight and center of gravity of each completed aircraft are accurately determined. The holder of a production certificate may submit, for FAA consideration, a proposal based on a reliable statistical plan and evidence of product uniformity, if he desires to utilize an average empty weight and center of gravity, in lieu of weighing each aircraft.

3 The aircraft equipment list and, when applicable, loading charts and instructions are accurate.

(c) Functional tests of each completed product are conducted to determine whether the operating characteristics meet the approved design provisions. Examples of the type of tests generally found to be acceptable are as follows:

1 Each completed aircraft would be subjected to a flight test in accordance with flight test procedures and checkoff lists developed from operation characteristics and data which were found to comply with the applicable airworthiness regulations during the type test evaluation program, and approved as a part of the quality control data.

2 Except as noted in subparagraph d below, each completed engine would be subjected to a test run, including:

a Break-in to determine that engine operating parameters are as specified in the type design data.

b Internal inspection is necessary to determine that the engine is in condition for safe operation. The degree of such inspection may be based on a statistical sampling plan, evidence of product uniformity, a satisfactory history of previous internal inspections, and service experience.

c Determination of test instrumentation and power/thrust absorption devices, tolerances and correction to ensure that no production engine can be delivered with less than its type certificated rated power/thrust.

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- d Test firing of a sufficient number of rocket engines, selected from production lots in accordance with statistical sampling plans included in the manufacturer's quality control data, which, together with the close control of materials and processes, would ensure that each engine in the lot functions properly and developed its rated thrust for the time specified in the approved type design data.
  - e Each completed variable pitch propeller would be functionally tested to determine that it operates freely and smoothly throughout the normal range of operation, with maximum and minimum operating forces alternately applied, according to design and installation requirements.
- 3 A system to control the packing, preservation, and condition of spare articles incorporates procedures which ensure that:
  - a Spare articles conform to applicable type design data and have not exceeded their shelf-life limits.
  - b Prior to shipment of spare articles, all required modifications are accomplished in accordance with applicable design changes.
  - c Spare articles are lubricated, preserved, and packed in a manner to preclude corrosion or damage in shipment, especially internal damage not readily detectable by inspection for condition upon receipt.
- 4 Major assemblies and components, comprising a complete aircraft, manufactured under a production certificate may be exported prior to final assembly, inspection, and flight test in accordance with FAR 21.325(b), providing the holder of the production certificate has established FAA-approved assembly and flight test procedures; and the extent of disassembly is the same as an aircraft which has been disassembled for shipment purposes.

5 Completed products are considered to be submitted for airworthiness certification or approval when an engine or propeller is released for shipment, or in the case of an aircraft, when any one of the following documents as applicable, is completed, dated, signed, and submitted to an FAA representative.

a Application for Airworthiness Certificate, FAA Form 8130-6.

b Conformity Certificate - Military Aircraft, FAA Form 8130-2.

c Application for Export Certificate of Airworthiness, FAA Form 8130-1.

(12) Service Difficulties. A totally integrated quality control system would include the means of recording, investigating cause, and assuring corrective action on all known or reported failures, malfunctions, and defects, including procedures, as applicable to each particular manufacturer, to ensure that:

- (a) Service problems are investigated and prompt corrective action is taken on all affected products as appropriate.
- (b) Users of the product are informed of service difficulties and resultant FAA-approved changes to the type design in accordance with FAR 21.99 requirements.
- (c) Feedback on service problems is received from users of the products to the extent practicable.
- (d) Requirements of FAR 21.3 and FAR 37.17 relative to the reporting of certain malfunctions and defects are satisfied.

10. FAR 21.147 - CHANGES IN THE QUALITY CONTROL SYSTEM.

- a. An acceptable means of compliance with the notification requirements of this regulation is to notify the district office of changes falling within the scope of the regulation.
- b. Whenever changes in the quality control system result in the necessity for revision of the quality control data, an acceptable means for obtaining approval of such revisions would be to provide, with the notification, revised quality control data or supplementary information as may be required for review and approval by the district office.

- c. A change in suppliers or in the delegations of quality functions to suppliers may or may not result in changes to the production certificate holders approved quality control data and system. When it does, FAR 21.147 requires the holder to immediately notify the FAA in writing, of any change which may affect the inspection, conformity, or airworthiness of the product, and in order to comply with FAR 21.165(a), an FAA evaluation and approval will be necessary under FAR 21.143(a). When it does not, FAR 21.143(b) requires merely that information regarding such changes or delegations be made available to the FAA. For the foregoing reasons, an applicant for, or holder of, a production certificate is advised to submit quality control data which fully describes the controls which he will use to establish and control all supplier furnished articles or services, including general information on any type certificate or production certificate data, purchase orders, procurement specifications, etc., with which the supplier must comply.
11. FAR 21.151-PRODUCTION LIMITATION RECORD. The production certificate may not always authorize production of every model listed on the type certificate. The production limitation record (PLR) is the only means provided by the regulations for denoting each specific product; therefore, the FAA will list on the PLR, in addition to the type certificate, each model authorized for manufacture under the production certificate, and the date of such authorization.
12. FAR 21.153-AMENDMENT OF THE PRODUCTION CERTIFICATE.
- a. Application to amend a production certificate is made in the same form and manner as the original issue, except that only changes to the existing quality control data need be submitted, when production of the new product involves changes in the quality control system. If no changes in the quality control data are required, the situation should be documented by letter to the district office.
- b. Since a production certificate may be amended for several different purposes, the following paragraphs provide examples as to methods applicable in differing circumstances:
- (1) The holder of a production certificate may make application to add a new type certificate, new model, or a supplemental type certificate (STC) to his production certificate. Upon evaluation and approval of the quality control data and manufacturing facilities, as applicable, the FAA will issue a superseding production limitation record, which automatically cancels the existing one, except that STCs which are referenced in, and become a part of the approved type design data, will not be listed on the production limitation record.

- (2) When production of completed products as well as spare articles has ceased, the holder of a production certificate should request deletion of the applicable type certificate from his production limitation record by a letter to the regional office. A revised production limitation record will be issued, and the superseded production limitation record would be cancelled.
- (3) If the holder of a production certificate ceases to manufacture complete products, but continues to manufacture spare articles, his production limitation record does not require an amendment

13. FAR 21.157-INSPECTION AND TEST. Following the issuance of the production certificate, the FAA will maintain periodic surveillance of the production facilities and quality control system, by the use of a Quality Assurance Systems Analysis Review (QASAR) program. The QASAR program is a systems analysis by an inspection team of the manufacturer's complete quality control system. If an inspection or test conducted by such an inspection team discloses that any part of the data or system which was originally approved does not fully meet the applicable requirements, the FAA will request changes to the quality control system or data as may be required.
- a. The FAA considers any evidence of inspection approval placed on inspection records, test reports, or physical articles as documentation that the article, process, or manufacturing operation has been accepted by the holder of a production certificate.
  - b. If an article has passed through a point officially designated for inspection, the omission of any required stamps or signatures, which were designated to be applied at that point to the physical articles, inspection records, or test reports, may be considered as noncompliance with approved quality control data and procedures.
14. FAR 21.161-DISPLAY. The production limitation record is part of and should be displayed with the production certificate. The holder of a production certificate may make copies of the production certificate and production limitation record for display in offices of outlying plants which are part of the main manufacturing facilities.
15. FAR 21.163-PRIVILEGES. The holder of a production certificate may:
- a. Obtain airworthiness certificates and related approvals without further showing, except that the FAA may inspect products for conformity with the type design.
  - b. Obtain the appointment of individuals in his employ as Designated Manufacturing Inspection Representatives (DMIR) for the purpose of issuing airworthiness certificates and related approvals. (Ref. FAR, Part 183).

- c. Apply for Delegation Option Authorization (DOA), if the product he is producing qualifies under FAR 21.231.

16. FAR 21.165-RESPONSIBILITY OF THE HOLDER.

- a. The holder of a production certificate has a basic responsibility for controlling the manufacture of completed products and spare articles in conformity with his FAA-approved quality control data and type design requirements. Although this responsibility never changes, he may be relieved of some of the burden of inspection and testing duties when he:
  - (1) Uses other type certificated product or products manufactured under another person's production certificate, or which bear an FAA Airworthiness Approval Tag, FAA Form 8130-3.
  - (2) Uses articles produced under an FAA TSO authorization.
  - (3) Installs used articles that conform to the type design.
  - (4) Uses articles fabricated under an FAA Parts Manufacturing Approval.
  - (5) Delegates specific inspection and testing duties to suppliers.
    - (a) The holder of a production certificate may be relieved of some of the burden of inspection and testing when these functions are delegated to a supplier. However, the production certificate holder remains responsible for controlling the design, physical configuration, operating condition of the articles of products furnished by such a supplier. All changes made by a supplier, to the design or the physical product or article, must be submitted to the holder of the production certificate for evaluation and approval as applicable under FAR 21, Subpart D. Thus, the holder of a production certificate is responsible for obtaining FAA approval of materials review actions or other design changes including those made to supplier furnished articles which were not designed or manufactured by him and would also result in a change to his type design data or to his products.
    - (b) A supplier who holds an FAA production approval, PC, APIS, PMA, TSOA, or FAA Repair Station Certificate is also responsible when articles or services furnished by him, to the production approval holder:



- 1 Do not conform to his (the supplier's) FAA-approved design data;
- 2 Were not manufactured or overhauled in accordance with the supplier's FAA-approved quality control data or repair station inspection procedures manual; or
- 3 Contain any defects which normally would not be found by the manufacturer in conducting his receiving inspections and functional tests and which would result in an unsafe product.



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